

Taking the line whose right ascension is  $270^\circ$  as the initial line, the polar coordinates of the projection of the points  $a$ ,  $D$  are  $\tan \frac{D}{2}$  and  $\alpha - 270^\circ$ , and the rectangular coordinates  $\tan \frac{D}{2} \cos (\alpha - 270^\circ)$  and  $\tan \frac{D}{2} \sin (\alpha - 270^\circ)$ . These are tabulated in the fourth and fifth columns of the above table. Assuming the equation of the circle to be

$$x^2 + y^2 + fx + gy + c = 0$$

the values of  $f$ ,  $g$ , and  $c$  are determined by a least-square solution, and the equation of the circle found to be

$$(x - .453)^2 + (y - .152)^2 = (.165)^2$$

This circle is the projection of the small circle whose centre is at R.A.  $288^\circ$  and N.P.D.  $50^\circ$ , and whose radius is  $16^\circ$ , giving  $198^\circ$  and  $130^\circ$  for the longitude of the node and equator of *Neptune*, and  $16^\circ$  for the inclination of the satellite's orbit to *Neptune's* equator.

The result obtained in this way agrees as closely as could be expected with that previously found, and probably closer accordance would have been obtained if more weight had been given to the later and more accurate observations. M. Tisserand, discussing the observations up to 1890, obtained entirely different results, and concluded that the inclination of the orbit of the satellite to the equator of *Neptune* was much greater. The present series of observations and those of Dr. Struve are of so much greater weight than the earlier observations that the value of the material for determining the inclination has been increased considerably. A glance at the diagram on p. 582 shows that observations have not yet been continued long enough for a determination of the inclination to be made with any degree of certainty. It is clearly of great importance that observations of the satellite should be continued, as it would seem that a series of good observations continued over another ten years would fix the position of *Neptune's* axis and the inclination of the orbit to it within a few degrees.

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*Reduction of the Right Ascensions of the Hong Kong Catalogue of 2120 Southern Stars for the Epoch 1900 to the System of Auwers' Southern Fundamental Stars.* By A. M. W. Downing, D.Sc., F.R.S.

From the Preface to the Hong Kong Catalogue of right ascensions of southern stars, recently published, we learn that Auwers' Catalogue, contained in *Astron. Nachrichten*, Nos. 3431-2, was generally used as the standard, but that occasionally

the clock errors were determined "from some stars in the *Nautical Almanac*; but as soon as any of the stars in the Hong Kong Catalogue had been observed four times they were used as standard stars and given weight equal to Auwers' right ascensions." It becomes a matter of interest, therefore, to investigate the systematic differences between the right ascensions of the Hong Kong Catalogue and those of Auwers' Catalogue, and I now lay before the Society the results of the investigation.

There are 300 stars, situated between  $20^{\circ}$  and  $60^{\circ}$  of south declination, common to the catalogues, and the places of these have been compared, using the proper motions given by Auwers.

The mean difference in the sense Auwers *minus* Hong Kong is  $+^s.0015$ .

The first table gives the corrections to the Hong Kong right ascensions when the stars are arranged in order of declination, and taken in zones extending each to  $5^{\circ}$  of declination. These quantities have been graphically represented on cross-ruled paper, and an interpolating curve drawn in the usual manner, from which the correction corresponding to any declination, between the limits, can be taken.

The corrections depending on declination have then been applied, with reversed signs, to the right ascensions of the stars used in the comparison, and the means of the residuals computed for each hour of right ascension. The result is shown in the second table.

The final tables give the corrections to the Hong Kong right ascensions, read off from the interpolating curves, which were drawn in the same manner for the corrections depending on right ascension and for those depending on declination. It will be understood that the complete reduction for any star is the sum of the reductions taken from these two tables, corresponding respectively to the declination and right ascension of the star.

*Corrections depending on Declination.*

| Mean<br>South Decl. | Computed<br>Correction.<br><sup>s</sup> | No. of<br>Stars. | Mean<br>South Decl. | Computed<br>Correction.<br><sup>s</sup> | No. of<br>Stars. |
|---------------------|-----------------------------------------|------------------|---------------------|-----------------------------------------|------------------|
| 22 <sup>o</sup> 6   | + '007                                  | 41               | 41 <sup>o</sup> 8   | + '010                                  | 41               |
| 27 <sup>o</sup> 1   | - '001                                  | 37               | 46 <sup>o</sup> 8   | - '003                                  | 37               |
| 32 <sup>o</sup> 3   | - '004                                  | 42               | 52 <sup>o</sup> 2   | + '004                                  | 41               |
| 36 <sup>o</sup> 8   | '000                                    | 37               | 56 <sup>o</sup> 8   | - '004                                  | 24               |

*Corrections depending on Right Ascension.*

| Mean<br>R.A.<br>h m | Computed<br>Correction.<br><sup>s</sup> | No. of<br>Stars. | Mean<br>R.A.<br>h m | Computed<br>Correction.<br><sup>s</sup> | No. of<br>Stars. |
|---------------------|-----------------------------------------|------------------|---------------------|-----------------------------------------|------------------|
| 0 27                | - '014                                  | 13               | 5 28                | - '008                                  | 13               |
| 1 32                | - '006                                  | 13               | 6 31                | + '006                                  | 14               |
| 2 30                | + '005                                  | 13               | 7 29                | + '005                                  | 15               |
| 3 30                | - '002                                  | 12               | 8 27                | - '015                                  | 12               |
| 4 22                | - '003                                  | 11               | 9 32                | + '006                                  | 13               |

| Mean<br>R.A.<br>h m | Computed<br>Correction.<br>s | No. of<br>Stars. | Mean<br>R.A.<br>h m | Computed<br>Correction.<br>s | No. of<br>Stars. |
|---------------------|------------------------------|------------------|---------------------|------------------------------|------------------|
| 10 32               | −.001                        | 10               | 17 28               | +.013                        | 12               |
| 11 31               | −.008                        | 11               | 18 29               | +.005                        | 12               |
| 12 26               | +.009                        | 12               | 19 33               | −.006                        | 16               |
| 13 30               | +.003                        | 14               | 20 34               | +.004                        | 12               |
| 14 28               | +.009                        | 9                | 21 22               | −.009                        | 11               |
| 15 39               | −.009                        | 9                | 22 24               | +.021                        | 14               |
| 16 30               | +.001                        | 4                | 23 26               | −.004                        | 15               |

Corrections depending on Declination.

| South<br>Decl.<br>° | Adopted<br>Correction.<br>s | South<br>Decl.<br>° | Adopted<br>Correction.<br>s | South<br>Decl.<br>° | Adopted<br>Correction.<br>s |
|---------------------|-----------------------------|---------------------|-----------------------------|---------------------|-----------------------------|
| 22.5                | +.007                       | 35.0                | −.002                       | 47.5                | −.002                       |
| 25.0                | +.003                       | 37.5                | +.001                       | 50.0                | +.001                       |
| 27.5                | −.001                       | 40.0                | +.005                       | 52.5                | +.004                       |
| 30.0                | −.003                       | 42.5                | +.008                       | 55.0                | −.001                       |
| 32.5                | −.004                       | 45.0                | +.001                       | 57.5                | −.004                       |

Corrections depending on Right Ascension.

| R.A.<br>h | Adopted<br>Correction.<br>s | R.A.<br>h | Adopted<br>Correction.<br>s | R.A.<br>h | Adopted<br>Correction.<br>s |
|-----------|-----------------------------|-----------|-----------------------------|-----------|-----------------------------|
| 0         | −.010                       | 8         | −.007                       | 16        | −.004                       |
| 1         | −.010                       | 9         | −.007                       | 17        | +.007                       |
| 2         | −.002                       | 10        | +.003                       | 18        | +.009                       |
| 3         | +.002                       | 11        | −.003                       | 19        | −.001                       |
| 4         | −.003                       | 12        | .000                        | 20        | −.002                       |
| 5         | −.006                       | 13        | +.006                       | 21        | −.002                       |
| 6         | −.001                       | 14        | +.006                       | 22        | +.011                       |
| 7         | +.005                       | 15        | +.001                       | 23        | +.008                       |

It should be noted that in the observations made at Hong Kong “stars of the 6th magnitude and brighter were screened, so as to appear of about magnitude  $6\frac{1}{2}$  or 7.” The stars included in the present comparison are, of course, for the most part bright stars, and would, therefore, in the great majority of cases have been observed through screens for the purpose of eliminating the relative magnitude-equation, as it affects the observed transits of bright stars.

1905 April 13.

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*Revised Elements of UY Cygni (Ch. 7514).*R.A. =  $20^{\text{h}} 52^{\text{m}} 16^{\text{s}}$ , Decl. =  $+30^{\circ} 2' 8''$  (1900).

By A. Stanley Williams.

The period of  $13^{\text{h}} 27^{\text{m}} 20^{\text{s}}.85$  found for this variable star in 1903\* was based on the assumption that a photograph obtained here on 1900 November 22 was taken when the star was either at, or at any rate very near, its maximum brightness. The observations of the summer and autumn of the same year showed, however, that this period was somewhat too short, and it appears that the star was really nearly an hour and a half past maximum at the time when the photograph above referred to was taken. Dr. E. Hartwig obtained a period of  $13^{\text{h}} 27^{\text{m}} 27^{\text{s}}.59$  from the comparison of two maxima observed by him on 1902 June 28 and 1903 October 28.† In the present note fresh elements have been derived from the visual observations of the three years 1902, 1903, and 1904.

Table I. contains all the observed times of  $T_0$ , that is, the time when the variable in its rapid rise from minimum attained to equality with the comparison star  $c(10^{\text{m}}.2)$ .‡ These observations were all made with a  $6\frac{1}{2}$ -inch reflector. The third column of the table gives the observed geocentric time of  $T_0$ , and the fourth column the approximate correction for the light-equation. The other columns will explain themselves.

TABLE I.  
*Observed and Computed Times of  $T_0$ .*

| E.   | Date.        | Observed $T_0$ . |    | Red to $\odot$ . | Heliocentric $T_0$ . |      | Computed $T_0$ . | O—C.   |
|------|--------------|------------------|----|------------------|----------------------|------|------------------|--------|
|      |              | h                | m  | m                | h                    | m    | h m              | m      |
| 1138 | 1902 Aug. 22 | 10               | 10 | +6.5             | 10                   | 16.5 | 10 10.7          | + 5.8  |
| 1145 | 26           | 8                | 23 | +6.5             | 8                    | 29.5 | 8 22.7           | + 6.8  |
| 1147 | 27           | 11               | 18 | +6.5             | 11                   | 24.5 | 11 17.5          | + 7.0  |
| 1293 | Nov. 17      | 7                | 52 | +0.3             | 7                    | 52.3 | 8 1.2            | — 8.9  |
| 1634 | 1903 May 27  | 12               | 33 | +0.7             | 12                   | 33.7 | 12 52.4          | — 18.7 |
| 1789 | Aug. 22      | 10               | 40 | +6.5             | 10                   | 46.5 | 10 43.0          | + 3.5  |
| 1814 | Sept. 5      | 11               | 10 | +6.3             | 11                   | 16.3 | 11 8.6           | + 7.7  |
| 1821 | 9            | 9                | 18 | +6.2             | 9                    | 24.2 | 9 20.6           | + 3.6  |
| 1830 | 14           | 10               | 19 | +6.0             | 10                   | 25.0 | 10 27.3          | — 2.3  |
| 1846 | 23           | 9                | 51 | +5.5             | 9                    | 56.5 | 9 46.1           | + 10.4 |
| 2408 | 1904 Aug. 3  | 12               | 35 | +6.3             | 12                   | 41.3 | 12 37.7          | + 3.6  |
| 2417 | 8            | 13               | 40 | +6.4             | 13                   | 46.4 | 13 44.5          | + 1.9  |
| 2422 | 11           | 8                | 43 | +6.5             | 8                    | 49.5 | 9 1.6            | — 12.1 |
| 2424 | 12           | 11               | 41 | +6.5             | 11                   | 47.5 | 11 56.5          | — 9.0  |
| 2488 | Sept. 17     | 9                | 18 | +5.9             | 9                    | 23.9 | 9 11.5           | + 12.4 |

\* *Monthly Notices*, vol. lxiii. p. 307.† *V.J.S. der Astron. Gesell.*, Jahrgang 38, Heft 3, p. 240.‡ See diagram in the *Monthly Notices*, vol. lxiii. p. 305.